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pe·riph·er·al (pə-rīf'ər-əl)
adj.

1. Related to, located in, or constituting an outer boundary or periphery.
2. Perceived or perceiving near the outer edges of the retina: **peripheral vision**.
3. *Anatomy*
 - a. Of the surface or outer part of a body or organ; external.
 - b. Of, relating to, or being part of the **peripheral** nervous system.
4. Of minor relevance or importance.
5. Auxiliary.

n. **Computer Science**

An auxiliary device, such as a printer, modem, or storage system, that works in conjunction with a computer.

pe·riph'·er·al·ly *adv.*

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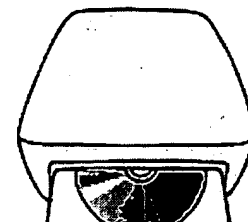
Noun 1. peripheral - (computer science) electronic equipment connected by cable to the CPU of a computer; "disk drives and printers are important peripherals"

computer peripheral, peripheral device

computer, computing device, computing machine, data processor, electronic computer,

information processing system - a machine for performing calculations automatically

electronic equipment - equipment that involves the controlled conduction of electrons



(especially in a gas or vacuum or semiconductor)

printer - (computer science) an output device that prints the results of data processing

computer science, computing - the branch of engineering science that studies (with the aid of computers) computable processes and structures

Adj. 1. **peripheral** - on or near an edge or constituting an outer boundary; the outer area; "Russia's **peripheral** provinces"; "**peripheral** suburbs"

central - in or near a center or constituting a center; the inner area; "a central position"; "central heating and air conditioning"

2. **peripheral** - related to the key issue but not of central importance; "a **peripheral** interest"; "energy is far from a **peripheral** issue in the economy"; "**peripheral** issues"

incidental, incident - (sometimes followed by 'to') minor or casual or subordinate in significance or nature or occurring as a chance concomitant or consequence; "incidental expenses"; "the road will bring other incidental advantages"; "extra duties incidental to the job"; "labor problems incidental to a rapid expansion"; "confusion incidental to a quick change"

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Ileal Neobladder for Urinary Bladder Replacement following Total Pelvic Exenteration for Rectal Carcinoma

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Key Words

Total pelvic exenteration · Locally advanced rectal carcinoma · Ileal neobladder

Abstract

Objective: The aim of this study was to determine the feasibility of using the ileal neobladder as a substitute for the urinary bladder following total pelvic exenteration for rectal carcinoma. **Patients and Methods:** Between 1992 and 1998, we performed total pelvic exenteration with ileal neobladder in 5 men with rectal carcinoma. Four patients had primary tumors, and one had recurrent disease after low anterior resection for rectal carcinoma. Histological types were adenocarcinoma in 4 and squamous cell carcinoma in 1. Invaded organs were: the urinary bladder in 1, the urinary bladder and prostate in 2, the prostate and seminal vesicle in 1, and the prostate in 1. **Results:** There was no operative death. In 1 patient, an ileal conduit was needed because of partial necrosis of the neobladder. Minor leakage on the dorsal wall of the neobladder occurred in 2 patients, which was successfully stopped with simple closure and a gluteus maximus fasciocutaneous flap, respectively. All except one patient with the ileal conduit could void via the urethra.

Complete daytime urinary continence was achieved, but nocturnal continence was maintained with voiding once or twice per night. As the urodynamic state, the mean maximum flow rate was 20.9 ml/s (range 9.0–34.1), the mean average flow rate was 7.7 ml/s (range 3.0–11.0), and the mean voided volume was 285.5 ml (range 160–432). The mean length of follow-up was 47.8 months. One patient died of local recurrence 38 months postoperatively, and 1 died of pneumonia 10 months postoperatively. Both patients could void via the urethra until death. The other three patients are currently alive without any evidence of recurrence. **Conclusions:** Although total pelvic exenteration is a laborious surgical procedure, an ileal neobladder could be a good alternative to the urinary bladder enabling the patients to void via the urethra with urinary continence.

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Introduction

Approximately 6–10% of rectal carcinomas are locally advanced at presentation and require extensive surgery for complete tumor extirpation [1]. Total pelvic exenteration involving en bloc removal of the rectum, urinary

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Table 1. Demographics of patients with rectal carcinoma who underwent total pelvic exenteration with reconstruction of ileal neobladder

Patient No.	Age years	Gender	Tumor status	Histological type	Invaded adjacent organs
1	58	male	primary tumor	well-differentiated adenocarcinoma	urinary bladder
2	57	male	recurrent tumor	moderately differentiated adenocarcinoma	urinary bladder/prostate
3	47	male	primary tumor	well-differentiated adenocarcinoma	urinary bladder/prostate
4	68	male	primary tumor	squamous cell carcinoma	prostate/seminal vesicles
5	50	male	primary tumor	moderately differentiated adenocarcinoma	prostate

bladder, distal ureters and reproductive organs may be required to obtain negative margins of resection [2]. However, ureterocutaneostomy or an ileal conduit is usually employed for urinary diversion following total pelvic exenteration, resulting in double stomas along with an artificial anus, which reduces the quality of life of the patients.

Orthotopic neobladders are a viable alternative for patients undergoing radical cystectomy for bladder carcinoma enabling them to void via the urethra with urinary continence [3], and this is a well-accepted technique with excellent results on long-term follow-up [4]. Since 1992, following total pelvic exenteration for rectal carcinoma we have constructed ileal neobladders according to the technique of Studer et al. [4] with some modifications. In this study, we analyzed data from 5 patients who received an ileal neobladder as a substitute for the urinary bladder. To our knowledge, there have been no reports of this procedure having been previously performed following total pelvic exenteration for rectal carcinoma.

Patients and Methods

Patients

Between December 1992 and August 1998, 5 men with rectal carcinoma underwent total pelvic exenteration with an ileal neobladder at our institute (table 1). Patients ranged in age from 47 to 68 years old (mean 56 years old). Four patients had primary tumors, and one had recurrent disease after low anterior resection for rectal carcinoma. Histological types were adenocarcinoma in 4 patients and squamous cell carcinoma in 1. Invaded organs were the urinary bladder in 1 patient, urinary bladder and prostate in 2, prostate and seminal vesicles in 1 and prostate in 1. These patients had no distant metastases or peritoneal dissemination.

None of the patients received pre- and/or post-operative radiotherapy. All patients were given chemotherapy with 5-fluorouracil postoperatively.

Surgical Technique

Patients were placed in the supine frog leg position. Total pelvic exenteration was performed including resection of all pelvic viscera and radical pelvic lymph node dissection. For total cystoprostatectomy, the membranous urethra was transected as close as possible to the apex of the prostate in order to preserve the external urethral sphincter. The negative margin of resection was confirmed by examining frozen sections intraoperatively.

Constructing of Ileal Neobladder – N-Pouch

An ileal segment, ca. 60 cm in length, was isolated 25 cm proximal to the ileocecal valve. The bowel continuity was restored with functional side-to-side anastomosis. Appendectomy was performed according to routine procedures. After irrigation with sterile saline, the isolated ileal segment was arranged in an N-shape configuration and the distal 40-cm of the segment was incised along the anti-mesenteric border (detubularization) [5]. After suturing the inner margins of the incision to form the dorsal wall of a pouch with continuous sutures of 3/0 Vicryl®, the outer margins were closed.

An enterostomy 1 cm in diameter was made in the lowest part of the pouch wall. The bowel mucosa around the circumference of this new ostium was everted with interrupted sutures of 3/0 Vicryl. Urethroncobladder anastomosis was performed by placing 5 interrupted 2/0 Monocryl® sutures over an indwelling 22-Fr balloon catheter with multiple side holes (Fuji Systems, Tokyo, Japan). The neobladder was rinsed postoperatively, and mucus clots were aspirated out to avoid mucus tamponade. Our balloon catheter had multiple side holes so that it could not be easily obstructed by mucus. We found the suprapubic 'cystostomy tube' unnecessary.

We made two modifications as compared to the original technique of Studer et al. [4]. Studer's technique uses a cross-folded J-pouch and the mesentery is at the bottom of the pouch so that it should be rotated somewhat to create the inner ostium in the lowest part of the pouch. Our N-pouch is easier to create and position in the inner ostium. The other modification was side-to-side anastomosis of the distal portion (5 cm in length) of both ureters with continuous sutures of 3/0 Vicryl. The size of the proximal end of the intact segment was tailored to the same size as the end of the ureters. End-to-end anastomosis between the unified ureters and the intact segment of neobladder was performed with interrupted sutures of 3/0 Vicryl. A 7-Fr single-J stent tube was inserted into the ureter. The ureteral stents were brought out through the ventral wall of the intact segment and anterior abdominal walls. The stents were fixed to the peritoneum as they exited from the neobladder and penetrated the abdominal wall.

Table 2. Results of total pelvic exenteration with reconstruction of ileal neobladder

Patient No.	Duration of surgery, min	Blood loss ml	Postoperative complication	Treatment	Hospital stay months	Follow-up months	Outcome
1	540	1,870	uneventful	—	2	72	alive
2	660	13,900	uneventful	—	3	38	dead
3	620	5,753	partial necrosis of neobladder	ileal conduit	3	60	alive
4	610	3,627	minor leakage of neobladder	simple closure	2	11	dead
5	625	3,061	minor leakage of neobladder	closure with flap ¹	3	17	alive

Patients described in table 1.

¹ Left gluteus maximus fasciocutaneous flap.

Results

Table 2 shows the details of the surgical procedure. The mean surgical duration for total pelvic exenteration, reconstruction of artificial anus and ileal neobladder was 611 min (range 540–660). The mean estimated blood loss was 5,762 ml (range 1,870–13,900). Excluding patient No. 2 who had massive hemorrhage due to injury to the presacral venous flexus, the mean blood loss was 3,562 ml. Due to partial necrosis, the pouch in patient No. 3 was replaced with an ileal conduit 1 month postoperatively. Minor leakage on the dorsal wall of the neobladder occurred in 2 patients (No. 4 and 5). In patient No. 4, the leakage was successfully stopped by simple closure 8 months postoperatively. In patient No. 5, a gluteus maximus fasciocutaneous flap was employed to close the leakage 2 months postoperatively. Leakage of the ileoureteral anastomosis or ureteral stricture has not occurred. There were no hospital deaths. Mean postoperative hospital stay was 2.6 months (range 2–3).

All patients excluding patient No. 3 with an ileal conduit could void via the urethra. They had no residual urine and did not require clean intermittent self-catheterization. Complete daytime urinary continence was achieved in all 4 patients. For nocturnal continence, the use of an alarm clock and voiding once or twice at night was necessary for the first 1 or 2 years postoperatively. In the absence of long-term antibiotic prophylaxis, none of the patients showed clinical signs of pyelonephritis or ureteric obstruction.

Table 3 shows urodynamic assessments of the patients with ileal neobladder. The mean maximum flow rate was 20.9 ml/s (range 9.0–34.1), mean average flow rate was 7.7 ml/s (range 3.0–11.0) and mean voided volume was

Table 3. Urodynamic data of patients with rectal carcinoma who underwent total pelvic exenteration with reconstruction of ileal neobladder

Patient No.	MFR, ml/s	AFR, ml/s	VV, ml
1	34.1	11.0	432
2	25.5	9.0	160
3 ¹	—	—	—
4	15.0	8.7	250
5	9.0	3.0	300

MFR = Maximum flow rate; AFR = average flow rate; VV = voided volume.

Patients described in table 1.

¹ No data were obtained because of subsequent ileal conduit.

285.5 ml (range 160–432). Figure 1 shows the results of uroflowmetry in patient No. 1, 4 years postoperatively. The pattern was of intermittent flow in patients with neurogenic bladder. At postoperative neocystography (fig. 2), infusion of contrast medium under pressure resulted in reflux into the intact segment at a volume near capacity. However, excretory urograms and renal ultrasound scans revealed no hydronephrosis in any of the patients. None of the patients had vitamin B₁₂ deficiency. One patient (No. 2) required medical treatment for hyperchloremic metabolic acidosis.

Mean length of follow-up was 47.8 months (range 17–72 months). Patient No. 2 died of local recurrence 38 months postoperatively. There was no infiltration to the

Fig. 1. Uroflowmetry in patient No. 1, 4 years postoperatively. Dotted lines represent a scale of 10 ml/s. The pattern of flow is intermittent in patients with neurogenic bladder.

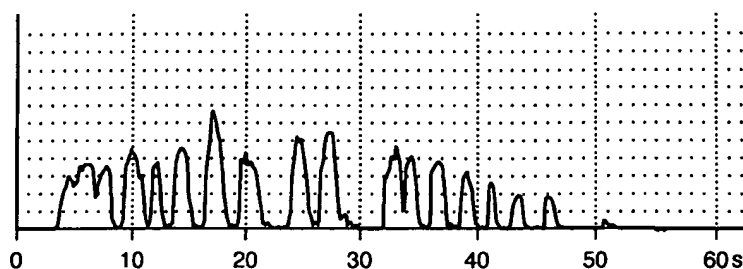


Fig. 2. Postoperative neocystography in patient No. 5, 2 months postoperatively. Reflux was seen in the intact segment when filled to capacity. Note the irregular shape of the intact segment due to peristalsis, whereas the wall of the pouch was regular. White arrow = Ileal pouch; black arrow = intact segment.



neobladder. Patient No. 4 died of pneumonia 10 months postoperatively. Both of these patients could void via the urethra until death. The other 3 patients are currently alive without any evidence of recurrence (table 2).

Discussion

Several intestinal segments such as the sigmoid colon, ileocecum and ileum have been used for construction of an orthotopic neobladder after total cystoprostatectomy. In the case of total pelvic exenteration for rectal carcinoma, a sigmoidal pouch is not suitable. Vitamin B₁₂ deficiency and its consequences may occur when the terminal

ileum is used for urinary diversion. Therefore, we used an ileal pouch following total pelvic exenteration.

To achieve continence, the pressure within the urinary reservoir has to be permanently below the resting tonus of the urethra, i.e. below 40 cm H₂O [4]. When the tubular intestinal structure remains intact, an increase in volume results in pressure peaks caused by peristalsis [4]. Transection of the longitudinal and circular musculature of the antimesenteric border of an ileal loop (detubularization) contributes to the low internal pressure and high compliance of the reservoir [6]. By arranging the ileal segments in opposite directions, a more spherical compartment can be created [6]. Use of an N-type pouch creates a larger capacity and lower pressure reservoir.

Despite previous reports on anti-reflux procedures, such as the nipple valve technique and the mucosal sulcus technique of Le Duc-Camey [7], a proximal tubular isoperistaltic ileal limb 20 cm in length (intact segment) is interposed between the ureters and the pouch in Studer's technique. In Studer's technique, equal pressure on the pouch and the intact segment is obtained, so that no differential pressure is created that would drive reflux [8]. At neocystography (fig. 2), while contrast medium was seen in the intact segment when the neobladder was filled to functional capacity, the contrast medium did not reach the ureters. In addition, it is also of benefit for the intact segment to be long enough to reach the divided ureters, allowing for tension-free anastomosis.

In patients with an orthotopic neobladder, the desire to void is replaced by discomfort or even pain in the suprapubic region [8], and urine is evacuated mainly by abdominal straining [4, 9]. Complete daytime urinary continence was achieved in our patients. However, they had nocturnal enuresis because of the lack of sensory reflexes while asleep. The use of an alarm clock and voiding once or twice at night is recommended for the first 1 or 2 years postoperatively. All of our patients were satisfied with their voiding function and urinary continence. The postoperative urodynamic state of our patients was excellent compared to normal adults. With the exception of patient No. 2, our patients demonstrated neither impaired electrolyte balance nor metabolic acidosis to date. This may have been due to the relatively small surface of intact intestinal mucosa [4]. Hyperchloremic metabolic acidosis is common in patients with bladder carcinoma as a consequence of use of a bowel segment for bladder replacement [10]. In most adult patients, however, this acidosis is of little consequence [11]. The patients have maintained sterile urinary tracts and have not required prophylactic antibiotics.

The major portion of the operative duration (about 10 h) and intraoperative blood loss in this study were due to surgical resection of the rectum, urinary bladder and prostate and pelvic lymphadenectomy. Reconstruction of the ileal neobladder took only about 1 h longer than reconstruction of the ileal conduit [personal experience, data not shown].

The long postoperative hospital stay of 2.6 months in our patients was mainly due to the postoperative ileus (patients No. 2 and 5) and/or leakage in the dorsal wall of the neobladder (patients No. 4 and 5). We have seen no leakage in the dorsal wall of the ileal neobladder in cases of bladder carcinoma. A large dead space in the pelvic cavity after total pelvic exenteration might have led to extraordi-

nary tension dorsally on the suture line in the wall of the neobladder due to stored urine postoperatively. One solution is to fill the dead space with a gracilis musculo-fasciocutaneous flap.

The patients must be fit enough to tolerate total pelvic exenteration, and those with distant metastases and/or peritoneal dissemination are excluded from this surgical procedure. In cases in which the surgical margin on the urethra is histologically negative, we construct an ileal neobladder instead of the ileal conduit. In patients with rectal cancer with invasion confined to the prostate gland alone, radical retropubic prostatectomy could be employed instead of total cystoprostatectomy [12]. However, it is difficult to distinguish between true invasion and inflammatory changes even at intraoperative examination. The autonomic nerve to the urinary bladder cannot be preserved so that patients would have a neurogenic bladder postoperatively, although Campbell et al. [12] reported satisfactory control of voiding function in two patients who underwent retropubic prostatectomy and vesicourethrostomy with restorative proctosigmoidectomy. In addition to the patients described here, we have also successfully created an ileal neobladder as a urinary bladder substitute in a 63-year-old male patient with carcinoma of the sigmoid colon invading the urinary bladder and prostate gland. He underwent proctosigmoidectomy (anal sphincter preserved) and total cystoprostatectomy.

Our patients did not receive preoperative chemoradiation therapy, which might have reduced the tumor size and made the total pelvic exenteration unnecessary. However, we were concerned about the difficulty in distinguishing between tumor invasion and the fibrous changes due to preoperative chemoradiation therapy intraoperatively. Another concern with preoperative radiotherapy is the possibility of radiation-induced enteritis. Therefore, it is wise not to use an ileal neobladder in patients who have received preoperative radiotherapy. Some researchers have reported improvement of local control of locally advanced primary rectal carcinoma requiring total pelvic exenteration by addition of postoperative radiotherapy [13]. The small bowel is thought to be more vulnerable to radiation than the colon. It is therefore necessary to evaluate the safety of irradiation of the ileal neobladder.

Although total pelvic exenteration is a laborious surgical procedure, an ileal neobladder could be a good alternative to the urinary bladder enabling the patients to void via the urethra with urinary continence.

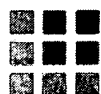
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Title:

Artificial anus device

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United States Patent 5209744

Abstract:

An **artificial anus** device consists of a device body and an excreta receptacle bag, a user with a belt. The device body is provided in its central portion with a through hole bag and an **artificial anus** are to be inserted, and on the portion thereof which is an abdomen pressure contacting portion of a predetermined thickness formed integrally contacting portion is provided in the outer circumferential surface of its base part with which the excreta receptacle bag can be detachably engaged. The device body is provided on the left and right sides of and symmetric with respect to the through hole and the abdomen pressure contacting portion with locking holes in which both end portion excreta receptacle bag has a cylindrical bag body formed out of flexible rubber or synthetic resin and a ring type locking portion to be engaged detachably with the recessed locking portion on the opposite side of the open end thereof, the film which constitutes the excreta receptacle bag has a pressure contacting portion of and the inner surface of the through hole in the device body being engaged detachably with the recessed locking portion.

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Claims:

What is claimed is:

1. An **artificial anus** device comprising:

an excreta receptacle bag comprising a flexible bag body made from a thin film and having an opening; and a device body for securing said receptacle bag to an abdomen, said device body comprising a through hole and an annular recess disposed around said through hole and a locking portion disposed around an outer circumference of said device body;

wherein said one side of said receptacle bag is inserted through said through hole and an edge of said bag is disposed in said annular recess such that said thin film covers said abdomen pressure contacting portion and an edge of said annular recess has a depth deeper on one side of said outer circumference of said device body than on the other outer circumference of said device body.

2. An **artificial anus** device according to claim 1, wherein a cut edge portion of said device body is provided on a device body opposite said one side and on a non-pressure contacting portion of said device body, which is substantially flush with or slightly higher than a depth of said annular recess.

3. An **artificial anus** device according to claim 1, further comprising a protective projection formed on a device body around said through hole and projecting in a direction away from said pressure contacting portion.

4. An **artificial anus** device according to claim 3, further comprising a bore provided in a lower portion of said device body.

5. An **artificial anus** device according to claim 1, further comprising an auxiliary flexible bag fastened to said device body so as to enclose said excreta receptacle bag.

6. An **artificial anus** device according to claim 1, wherein said excreta receptacle bag comprises a bag made of rubber or synthetic resin and having a locking ring at said open end thereof, wherein said locking ring is disposed in said annular recess.

7. An **artificial anus** device comprising:

an excreta receptacle bag comprising a flexible bag body made from a thin film and having an opening; and a device body for securing said receptacle bag to an abdomen, said device body comprising a through hole and a protective projection disposed around said hole, a locking portion of said device body around said through hole and projecting in a direction opposite from said pressure contacting portion comprising an annular recess disposed around an outer circumferential surface of said protective projection;

wherein said one end of said receptacle bag is engaged around said projection and an edge of said bag is disposed in said annular recess and the other circumferential surface of said protective projection comprises a stepped surface having first and second outer diameter portions, said first outer diameter portion being larger than said second outer diameter portion, said first outer diameter portion having an auxiliary bag locking portion comprising a first annular recess and said second outer diameter portion having an excreta bag locking portion comprising a second annular recess.

8. An **artificial anus** device according to claim 7, further comprising a bore provided in a lower portion of said device body.

9. An **artificial anus** device according to claim 7, further comprising an auxiliary flexible bag fastened to said device body so as to enclose said excreta receptacle bag.

10. An **artificial anus** device according to claim 7, wherein said excreta receptacle bag comprises a bag made of rubber or synthetic resin and having a locking ring at said open end thereof, wherein said locking ring is disposed in said annular recess.

annular recess.

Description:

BACKGROUND OF THE INVENTION

This invention relates to an **artificial anus** device used by a person who has had his rectum cut off and who has an **artificial anus** provided with a throwaway excreta receptacle bag, free from the leakage of the device is used, and capable of disposing excreta easily.

A conventional commercially available **artificial anus** device has a mount member formed out of a material provided with a pad attached with a double coated adhesive tape to the surface thereof which is on top of an excreta receptacle bag attached with a double coated adhesive tape to the surface thereof which is on the skin, the device being fixed to the waist of the user with a belt.

The mount member is provided in its central portion with a hole into which an **artificial anus** is to be inserted, and the left and right sides thereof which are on the left and right sides of and symmetric with respect to the central hole with loops of the belt are to be engaged. The skin-side surface of the mount member is provided with a flange extending from the circumferential portion of the central hole. The pad consists of sponge, and is provided with a hole into which the **artificial anus** is to be inserted, and in a hole-surround portion thereof with a pliable material. The excreta receptacle bag is formed out of vinyl and provided in its side wall with a hole larger than the hole.

However, with the above-described conventional **artificial anus** device, it is difficult to remove the device from the mount member with the excreta held in the bag perfectly without causing the excreta to leak to the user. If the user has loose bowels, the excreta receptacle bag has to be replaced frequently, and this very much hinders the use of the **artificial anus** device out of necessity.

Since the pad which is in contact with the skin of a user in this **artificial anus** device consists of sponge, the excreta leaks out sometimes to cause the underwear to be soiled or even an offensive odor to be emitted. Furthermore, since the pad permeates into the skin, the portion of the skin which is in contact with the pad has often eruption or sores.

The first named one of the joint inventors of the present invention underwent an operation for rectum removal and has used a conventional **artificial anus** device until a recent date but this device has various kinds of drawbacks. Under the circumstances, he has taken in his daily life such food that does not cause him to have loose bowels from going out and making a trip so that the offensive odor emitted from the **artificial anus** device is not so strong.

SUMMARY OF THE INVENTION

An object of the present invention is to provide an **artificial anus** device which has an excreta receptacle bag which can be removed and discarded simply after excreta has gathered therein, without soiling the surroundings, and which is free from the leakage of a gas and excreta and the roughening of the skin of the user.

To achieve this object, the first named inventor of the present invention practically used himself an **artificial anus** device as a way of trial, and both of the present inventors have made various improvements to this device repeatedly and earnestly and continuously to develop the following means.

The **artificial anus** device according to the present invention consists of a device body, and an excreta receptacle bag detachably with the device body. The device body is provided with a central through hole, and an abdominal pressure contacting portion and a locking portion which are formed at and in the part of a skin-contacting region of the device body around the central through hole. The excreta receptacle bag has a flexible bag body opened at one end thereof and closed at the other end thereof.

When the excreta receptacle bag is fastened to a device body, the film constituting the excreta receptacle bag is in pressure contacting portion and the inner surface of the central through hole. This excreta receptacle bag is detachably engaged by detachably engaging the open end portion of the former with the locking portion of the latter. The device body has a protective projection on the portion of the non-pressure-contacting surface thereof which is around the central through hole. The device body can further be provided with a flexible auxiliary bag detachably so that the auxiliary bag can be used when the excreta receptacle bag is full.

In order to use the **artificial anus** device of the above-described construction, the excreta receptacle bag is fastened to the central through hole in the device body, and the open end portion of the former is fitted in the locking portion of the latter. As a result, the abdominal pressure contacting portion and the inner surface of the device body are covered with the film constituting the excreta receptacle bag. The **artificial anus** device can be used by the body of a user simply by merely inserting the **artificial anus** into the through hole and fixing the device body with a belt. When excreta has gathered in the excreta receptacle bag, the device body is pulled so as to pull the excreta receptacle bag out of the device body.

device slightly from the abdomen, and bathroom tissue is rounded and packed in the open end portion which is then removed from the device body and discarded.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an **artificial anus** device fastened to a human body C;

FIG. 2 is a plan view of a device body of a first embodiment of the present invention;

FIG. 3 shows a longitudinal section of the device body of FIG. 2;

FIG. 4 shows a longitudinal section of an excreta receptacle bag in the first embodiment;

FIG. 5 shows a longitudinal section of the **artificial anus** device of the first embodiment;

FIG. 6 is a plan view of a modified embodiment of the device body of the first embodiment;

FIG. 7 shows a side elevation of the modified embodiment of FIG. 6;

FIG. 8 is a plan view of a device body of a second embodiment of the present invention;

FIG. 9 shows a side elevation of the device body of FIG. 8;

FIG. 10 shows a longitudinal section of an **artificial anus** device of a third embodiment of the present invention;

FIG. 11 shows a front elevation of an auxiliary bag in the third embodiment of the invention;

FIG. 12 shows a side elevation of the auxiliary bag of FIG. 11;

FIG. 13 is a plan view of another embodiment of a protective projection; and

FIG. 14 is a sectional view, showing an excreta receptacle bag and an auxiliary bag which are fastened together.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

First Embodiment

FIG. 1 is a perspective view, showing an **artificial anus** device according to a first embodiment of the present invention. The device is fastened to the abdomen 20 of a human body C. This **artificial anus** device consists of a device body A and an excreta receptacle bag B. The device body A is fastened to the abdomen 20 with a belt 11. As shown in FIGS. 2 and 3, the device body A is provided with a through hole 12 into which the excreta receptacle bag B and an **artificial anus** D are to be inserted, the device body A which is around the through hole 12, with an abdomen pressure contacting portion 13 of a predetermined shape.

The outer circumferential surface of a base part of the abdomen pressure contacting portion 13 is provided with a locking portion 14 with which the excreta receptacle bag B is to be detachably engaged. The portions of the device body A which are on the left and right sides of and symmetric with respect to the locking portion 14 are provided with locking holes 15 with which both end portions of a belt 11 are to be engaged. As shown in FIG. 4, the excreta receptacle bag B has a cylindrical bag body formed out of flexible rubber or synthetic resin, and is provided at its one end with a locking portion 17 to be detachably engaged with the locking portion 14, the end portion of the bag B which is opposite to the locking portion 17 forming an open end 16 and a closed end portion 18.

FIG. 5 is a sectional view of the **artificial anus** device fastened to the abdomen 20 of the human body C. The excreta receptacle bag B is engaged at its flexible locking portion 17 with the locking portion 14 so as to increase the circumference of the locking portion 17, and thus fastened to the device body A with the closed end portion 18 passing through the through hole 12. The non-pressure-contacting side 19 which is on the opposite side of the abdomen pressure contacting portion 13 is provided with a pressure-releasing portion 21.

The open end 16 may not be provided in particular with the ring type locking portion 17. It can be engaged by putting the open end 16 over the locking portion 14 and binding the set open end 16 with a rubber band or the like therearound.

The **artificial anus** device described above is fastened to the abdomen 20 of the human body C as shown in FIG. 1. The **artificial anus** D is inserted into the through hole 12, inserting both end portions of the expansible belt 11 into the through hole 12 and tightening the belt 11 so that the device body is pressed moderately against the abdomen 20. Consequently, the comparatively hard abdomen pressure contacting portion 13 is pressed lightly against the soft elastic

excreta receptacle bag G to seal the relative portion of the abdomen. Accordingly, the excreta and gas 20 has no roughening nor eruption.

Since the film 21 encloses the abdomen pressure contacting portion 13 and the inner surface 22 of it is not soiled with the excreta. In order to discard the excreta-containing receptacle bag B, the device is separated slightly from the abdomen 20, and bathroom tissue is rounded and packed in the open end then pulled so as to be disengaged from the locking portion 14. The excreta receptacle bag B is then pulled out of hole 12, and discarded. A new excreta receptacle bag B is then fixed to the device body A in the same manner and the resultant **artificial anus** device is fastened to the abdomen 20. Since the device body A is not soiled and washed.

If the belt 11 is tightened a little closely, it may be expansible. Holding down the portions 28 which have locking holes 15 and locking portion 14 onto adjacent portions of the abdomen 20 with adhesive tape can reliably maintain the sealed state between the abdomen 20 and abdomen pressure contacting portion of the device fastening method.

If the recessed locking portion 14 is formed so that it is deeper at its lower side 29 and shallower at its upper side 6 and 7, and, if the locking portion 17 of the excreta receptacle bag B is fitted in the locking portion 14 thereof, the fastening of the excreta receptacle bag B to the device body A is done more easily.

If the part of the non-pressure-contacting portion 19 which corresponds to the upper side 30 of the locking portion 14, the cut edge is flush with the bottom of the recess in the locking portion 14 to form a cut 31 as shown in FIG. 10, the receptacle bag B can be removed from the device body A more simply by disengaging the locking portion 17 from the cut 31 while pressing the locking portion 17 against the surface of the cut 31.

Second Embodiment

A second embodiment of the present invention will now be described with reference to FIGS. 8 and 9.

The length of a projecting portion, which is beyond the skin of the abdomen 20, of an **artificial anus** D results of an operation for rectum cancer, and is generally not more than 5 cm. When the length of a projecting portion 19 is 1 cm, it is desirable that the **artificial anus** D be protected by providing a protective projection 27 on the side of the projecting portion 19. Namely, a tubular protective projection 27 is formed on the part of the non-pressure-contacting portion 19 around a through hole 12. A bore 23 is provided in the lower portion of the protective projection 27 so that the excreta receptacle bag B therethrough in the downward direction, whereby the excreta from the **artificial anus** D can be discharged into the excreta receptacle bag B. When the length of the projecting portion of the protective projection 27 is 1 cm, a bore 23 may not necessarily be provided.

Third Embodiment

A third embodiment of the present invention will now be described with reference to FIG. 10.

An auxiliary bag E is provided over the outer surface of an excreta receptacle bag so as to prevent leakage when the excreta receptacle bag B is broken or holed. Even when the excreta receptacle bag B should be holed, leakage stops there since the auxiliary bag E is provided over the outer surface thereof. A recessed auxiliary bag locking portion 24 is provided in the part of a device body A which is on a non-pressure-contacting side 19 thereof and an auxiliary bag E is then put over the excreta receptacle bag B so as to enclose the same, and the auxiliary bag locking portion 24 is fitted in the locking portion 24, whereby the auxiliary bag E is fastened detachably to the device body A by the auxiliary bag locking portion 25. The auxiliary bag E is formed out of flexible rubber or synthetic resin, and has a one-end-closed bag body, which is provided with an auxiliary bag locking portion 25.

FIGS. 11 and 12 show another embodiment of the auxiliary bag E, which is provided with a locking portion 24 adapted to be engaged with an auxiliary bag locking portion 24, and a flap 26 to be inserted under the skin and fastened thereto.

Fourth Embodiment

A fourth embodiment of the present invention will now be described with reference to FIGS. 13 and 14.

As previously mentioned, the length of a projecting portion beyond the abdomen 20 of an **artificial anus** D results of an operation for rectum cancer. This embodiment is adapted to be applied to a person using the **artificial anus** D of which has a comparatively large length.

As shown in FIG. 13, a device body Aa has a protective projection 27a on the outer surface 32 of which is provided with a stepped surface. This stepped surface is provided in its larger outer diameter part 33 with a grooved auxiliary bag locking portion 24.

outer diameter part 34 with a locking portion 14a with which an excreta receptacle bag B is engaged. an auxiliary bag E are fastened to the device body Aa by detachably engaging a locking portion 17 with auxiliary bag locking portion 25 with the locking portion 24a. When the length of the projecting portion is large, the free end 35 thereof extends to the outside of the device body Aa. Therefore, when excreta **anus**, the device body Aa is not soiled therewith even if the inner surface 22a of a through hole in the device body Aa with the film 21 of the excreta receptacle bag B. Since the excreta receptacle bag B is engaged with the locking portion 19a of the device body Aa, the fastening and detaching of the excreta receptacle bag B can be done easily. Other embodiments in which the excreta receptacle bag B is engaged with the skin side surface 10 of the device body Aa are also possible.

As described above, when the **artificial anus** device according to the present invention is used, the excreta receptacle bag B can be removed simply without soiling the device body A and clothes with the excreta, and replacement of the excreta receptacle bag B can be done easily. Leakage of a gas and excreta does not occur, nor do the roughening and eruption of the skin of the abdominal body A provided with a protective projection 27 is used, an **artificial anus** D is not compressed ever far from the surface of the abdomen 20. When a device body provided with an auxiliary bag E is used, the excreta receptacle bag B can be replaced even if the excreta receptacle bag B should be holed or broken. Accordingly, this **artificial anus** device provides relief without worrying about anything.

Since the present invention displays these effects, it is unnecessary for a user to take such food selection, to have loose bowels, and to restrain himself from going out or making a trip so that the offensive odor of the excreta device does not annoy others. Therefore, even a person who uses an **artificial anus** out of necessity can live in substantially the same manner as an ordinary person.

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